

## Corporate tax planning and thin-capitalization rules: evidence from a quasi-experiment

Overesch, Michael; Wamser, Georg

Postprint / Postprint

Zeitschriftenartikel / journal article

Zur Verfügung gestellt in Kooperation mit / provided in cooperation with:

www.peerproject.eu

### Empfohlene Zitierung / Suggested Citation:

Overesch, M., & Wamser, G. (2010). Corporate tax planning and thin-capitalization rules: evidence from a quasi-experiment. *Applied Economics*, 42(5), 563-573. <https://doi.org/10.1080/00036840701704477>

### Nutzungsbedingungen:

Dieser Text wird unter dem "PEER Licence Agreement zur Verfügung" gestellt. Nähere Auskünfte zum PEER-Projekt finden Sie hier: <http://www.peerproject.eu>. Gewährt wird ein nicht exklusives, nicht übertragbares, persönliches und beschränktes Recht auf Nutzung dieses Dokuments. Dieses Dokument ist ausschließlich für den persönlichen, nicht-kommerziellen Gebrauch bestimmt. Auf sämtlichen Kopien dieses Dokuments müssen alle Urheberrechtshinweise und sonstigen Hinweise auf gesetzlichen Schutz beibehalten werden. Sie dürfen dieses Dokument nicht in irgendeiner Weise abändern, noch dürfen Sie dieses Dokument für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen.

Mit der Verwendung dieses Dokuments erkennen Sie die Nutzungsbedingungen an.

**gesis**  
Leibniz-Institut  
für Sozialwissenschaften

### Terms of use:

This document is made available under the "PEER Licence Agreement". For more information regarding the PEER-project see: <http://www.peerproject.eu>. This document is solely intended for your personal, non-commercial use. All of the copies of this document must retain all copyright information and other information regarding legal protection. You are not allowed to alter this document in any way, to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public.

By using this particular document, you accept the above-stated conditions of use.

Mitglied der  
  
Leibniz-Gemeinschaft



### Corporate Tax Planning and Thin-Capitalization Rules: Evidence from a Quasi-Experiment

Journal:	<i>Applied Economics</i>
Manuscript ID:	APE-06-0759.R1
Journal Selection:	Applied Economics
Date Submitted by the Author:	06-Sep-2007
Complete List of Authors:	Overesch, Michael; Centre for European Economic Research (ZEW) Wamser, Georg; Ifo Institute for Economic Research
JEL Code:	G32 - Financing Policy Capital and Ownership Structure & G3 - Corporate Finance and Governance & G - Financial Economics, H25 - Business Taxes and Subsidies & H2 - Taxation, Subsidies, and Revenue & H - Public Economics, H26 - Tax Evasion & H2 - Taxation, Subsidies, and Revenue & H - Public Economics
Keywords:	Corporate Income Tax, Multinationals, Thin-Capitalization Rule, Difference- in-Differences, Firm-Level Data



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

# Corporate Tax Planning and Thin-Capitalization Rules: Evidence from a Quasi-Experiment

Michael Overesch  
(ZEW)<sup>‡</sup>

Georg Wamser  
(Ifo Institute)<sup>§</sup>

Revised Version, September 2007

**Abstract:** This paper investigates tax-planning behaviour by means of inter-company finance and the effectiveness of government countermeasures via thin-capitalization rules. A simple theoretical model which considers the financing decision of a multinational company is used to obtain empirical implications. The empirical analysis, based on German inbound investment data from 1996 to 2004, confirms a significant impact of tax-rate differentials on the use of inter-company debt. The effectiveness of the German thin-capitalization rule is tested by using legal amendments as natural experiments. The results suggest that thin-capitalization rules induce significantly lower internal borrowing. Hence, tax planning via internal finance is effectively limited by thin-capitalization rules.

**Keywords:** Corporate Income Tax, Multinationals, Thin-Capitalization Rule, Difference-in-Differences Estimation, Firm-Level Data

**JEL Classification:** G32, H25, H26

---

<sup>‡</sup> Centre for European Economic Research (ZEW), L 7,1, D-68163 Mannheim, Germany, [overesch@zew.de](mailto:overesch@zew.de).  
<sup>§</sup> Ifo Institute for Economic Research, Poschingerstr. 5, D-81679 Munich, Germany, [wamser@ifo.de](mailto:wamser@ifo.de).

# 1 Introduction

It is a well-established result, both theoretically and empirically, that taxes play an important role in determining the capital structure of companies (*e.g.* Modigliani and Miller, 1958, 1963; Desai, Foley and Hines, 2004). A multinational company in particular can choose its capital structure according to differences in international taxation, in order to minimize the tax burden of the whole company group. Borrowing from affiliates located in low-tax countries and lending to affiliates in high-tax locations will allow a deduction of interest payments from profits at high-tax locations and a reduction of the overall tax payments. Typically, high-tax countries attempt to restrict the use of inter-company loans by imposing so-called thin-capitalization or earning stripping rules to limit adverse revenue consequences. In recent years, increased attention has been given to the role of multinationals' profit shifting via inter-company loans. For example, the number of EU member countries that rely on some form of debt-to-equity restriction has increased from 8 in 1996 to 16 in 2005. From a theoretical perspective, these rules are suitable for limiting profit shifting (*e.g.* Fuest and Hemmelgarn, 2005; Panteghini, 2006). Nevertheless, empirical evidence as to whether governments have been successful is still rare. Indeed, this is crucial for policy makers who want to defend tax revenues against multinationals' cross-country tax planning. However, effective thin-capitalization rules possibly imply less financial flexibility for some firms and adversely affect investment. In order to evaluate this trade-off, it is important to find out more about the impact of thin-capitalization rules on financial decisions and the associated tax-revenue effects.

In providing evidence on the tax sensitivity of companies' capital structure choices, previous empirical studies have usually not taken into account thin-capitalization rules. However, for a sample of US controlled affiliates, Desai et al. (2004) show that higher local tax

1  
2  
3 rates are associated with higher debt-to-asset ratios. Their analysis points out that particu-  
4  
5 larly internal borrowing of US companies reacts sensitively to taxation. This result is con-  
6  
7 firmed by Buettner et al. (2006a), and by Mintz and Weichenrieder (2005) for German  
8  
9 multinationals. So far, evidence for the effects of thin-capitalization rules on companies'  
10  
11 decisions has only been provided by Buettner et al. (2006b). They find that thin-  
12  
13 capitalization rules effectively restrict debt finance but also affect investment levels of  
14  
15 German outbound investments.  
16  
17  
18

19  
20  
21  
22 The question we address in this paper is whether thin-capitalization rules effectively re-  
23  
24 strict multinationals tax-planning behaviour. For our empirical research we take German  
25  
26 inbound investment data. We expect German multinationals to engage in tax-planning ac-  
27  
28 tivities, because hardly any other country has higher statutory corporate tax rates than  
29  
30 Germany. We exploit legal amendments of the German thin-capitalization rule in 2001 and  
31  
32 2004, where only some legal forms were treated. This quasi-experimental setting enables  
33  
34 us to use a difference-in-differences approach to identify whether thin-capitalization rules  
35  
36 are successfully imposed. Our empirical analysis shows that both tax-rate differentials and  
37  
38 thin-capitalization rules are crucial for multinationals' capital structures. In particular, our  
39  
40 findings indicate that some companies, which were affected by a stricter thin-capitalization  
41  
42 rule, subsequently adjusted their capital structure. Hence, governments in high-tax coun-  
43  
44 tries are, to some extent, able to restrict multinationals' profit shifting.  
45  
46  
47  
48  
49  
50

51  
52  
53 The paper is organized as follows. We begin with some institutional details about the Ger-  
54  
55 man thin-capitalization rule. Thereafter, we set up a theoretical model, which considers the  
56  
57 financing decision of a multinational and takes into account a thin-capitalization rule. In  
58  
59 sections 4 and 5 we present the empirical investigation approach and the data. The empiri-  
60  
cal results are presented in section 6. Section 7 briefly concludes.

## 2 Some Institutional Details

The high level of German company taxation but also the comparatively low corporate tax revenues are well documented (see European Communities, 2005). Firms are burdened with a very high statutory tax rate comprising a corporate income tax and, additionally, a local trade income tax.

It is reasonable to assume that a multinational company allocates inter-company loans optimally with respect to differences in international taxation. Hence, taxable profits are reduced by means of interest deduction. As a result, jurisdictions lose corporate tax revenue and consequently try to defend their tax base by imposing some form of restriction, for example thin-capitalization rules. These rules, such as section 8(a) of the German corporate income tax law (KStG), typically limit interest deduction up to a fixed relation between equity and inter-company debt, i.e. the interest paid for an excess leverage cannot be deducted from the tax base.

Empirical identification of thin-capitalization rules, however, is difficult. In practice its application depends on several additional aspects besides the pure debt-to-equity ratio. Some inter-company loans are excluded, such as debt which fulfils the arm's length principle requirements or trade accounts payable due to internal deliveries of input goods. Furthermore, the debt-to-equity ratio is not only limited to internal leverage. For instance, a strategy called back-to-back finance, in which external debt is borrowed by an affiliate and simultaneously secured by a deposit of the parent company, is also prohibited by the German thin-capitalization rule. Whether back-to-back finance is ultimately considered as parent-company debt finance is often a matter of negotiation with tax authorities. Hence, we are not able to identify single companies in the data which are affected by thin-

capitalization rules, although we know the exact German threshold levels. Therefore, we use changes in the rules for some company groups, depending on their legal form, to obtain exogenous variation in this crucial explanatory variable.

The German thin-capitalization rule only applies to foreign affiliates that are incorporated.<sup>1</sup> First-tier foreign partnerships are not affected by the restriction and constitute a suitable non-treatment group when looking at legal amendments of this rule as natural experiments. The rule classifies two different types of incorporated companies. The first group of companies comprises ordinary corporations which are not classified as holdings. For purposes of this law, a holding is defined as a firm where more than 75% of total assets consist of shares in other corporations. For ordinary corporations, the allowed debt-to-equity ratio, called safe haven, was accepted at 3:1 before 2001. Yet, the safe haven debt-to-equity ratio was 9:1 in the case of a holding corporation, i.e. holdings could be used as loopholes. In 2001 and 2004, two important amendments of the German thin-capitalization rule were introduced. In 2001 the allowed debt-to-equity ratios were significantly reduced to 1.5:1 in the case of an ordinary corporation and to 3:1 in the case of a holding corporation, respectively. Nevertheless, a possible loophole in the shape of holding corporations remained. In 2004, this special rule for holding corporations was also abolished, i.e. the safe haven was generally constituted at 1.5:1 for every corporation. However, first-tier partnerships were not affected by these amendments.

To illustrate the change in the thin-capitalization rule, let us consider the following example. A German holding corporation has used internal debt as a source of finance, with an internal-debt-to-equity ratio of 4:1 in 2000. Hence, this corporation was allowed to deduct interest payments without restriction. Following the 2001 tax reform, however, the ac-

<sup>1</sup> One exemption would be the German rule introduced in 2004 which applies to cases in which a second-tier partnership is held by incorporated foreign affiliates. However, these cases are not considered in our analysis.

cepted ratio was reduced to 3:1. Therefore, the corporation was no longer able to deduct interest payments for 5 percentage points of its debt-to-equity share. Nevertheless, the corporation was not prohibited from maintaining its debt-to-equity ratio. It is important to bear in mind, however, that not every corporation—irrespective of its legal form—is affected by a stricter thin-capitalization rule. It is highly possible that many firms fall below the accepted debt-to-equity relation anyway. We will come back to this point in section 6, discussing which implications this has for the estimated coefficients.

### 3 A Model

We explain the impact of company taxation on the choice of debt or equity as a subsidiary's source of finance by the following simple model. We consider a firm with two separate companies, of which the parent company is denoted by 1 and the subsidiary by 2. If the parent company and the subsidiary are completely financed with equity, profits are determined by

$$\pi = f(k_1)(1-t_1) + f(k_2)(1-t_2) - r(k_1 + k_2).$$

$k_1$  and  $k_2$  denote invested capital,  $f(k_j)$  output at location  $j$ ,  $t_1$  and  $t_2$  the statutory tax rates at the respective locations. The opportunity costs of own capital are  $r(k_1 + k_2)$ . Note that an exemption system of repatriated foreign profits is assumed.<sup>2</sup>

The parent company can decide on the type of capital that is used to finance the subsidiary. Instead of equity, the parent company can provide capital by means of an inter-company loan. We denote the share of capital that is financed by such an internal credit as  $\mu_2$ , and the internal interest rate as  $i_2$ . Interest payments,  $i_2\mu_2$ , can be deducted for tax purposes by

<sup>2</sup> This is true for most European countries and Canada. Furthermore, the effect of a credit system equals an exemption system if  $t_2 > t_1$ . Otherwise, the affiliate's tax rate increases to  $t_1$ , depending on the time of retention. However, the general incentives remain if foreign profits are not distributed immediately.



the borrowing subsidiary 2. Simultaneously, interest payments are taxed at the lending company. Hence, the tax consequences of an inter-company credit are

$$i_2 \mu_2 k_2 (t_2^i - t_1),$$

where  $t_2^i$  is the tax rate avoided because of interest deduction. This tax rate can differ from the statutory company tax rate if interest payments are not fully deductible from corporate income. For example, in Germany only half of all interest payments can be deducted for local income tax purposes, i.e.  $t_2^i < t_2$ .

Moreover, we assume that inter-company loans are associated with additional costs, for example agency costs, because of asymmetric information (see Jensen and Meckling, 1976; Myers, 1977). Nevertheless, there are also non-tax reasons to use inter-company debt, such as short-term cash management between parent and affiliate, or the opportunity to control the local management through fixed annual interest payments (see Jensen, 1986). Hence, we introduce a convex cost function,  $c_2(\mu_2)$ ,<sup>3</sup> and a concave utility function,  $g_2(\mu_2)$ .<sup>4</sup>

Subsequently, the profit function of the firm can be described as

$$\begin{aligned} \pi = & f(k_1)(1 - t_1) + f(k_2)(1 - t_2) - r(k_1 + k_2) \\ & + [i_2 \mu_2 (t_2^i - t_1) - c_2(\mu_2) + g_2(\mu_2)]k_2. \end{aligned} \quad (1)$$

Obviously, the transition of equity into inter-company debt implies a direct profit shift from the borrowing affiliate 2 to the lending parent company 1 if the tax rate of the borrowing affiliate is higher than the tax rate of the lender.

---

<sup>3</sup>  $\frac{dc_2}{d\mu_2} > 0, \frac{d^2c_2}{d\mu_2^2} > 0$ .

<sup>4</sup>  $\frac{dg_2}{d\mu_2} > 0, \frac{d^2g_2}{d\mu_2^2} < 0$ .

The tax-rate differential between both locations creates incentives to use equity refinanced internal debt as a source of finance. It implies that profits are shifted to the lending affiliate. However, jurisdictions attempt to counteract these activities by imposing thin-capitalization rules, which typically limit interest deduction. Hence, interest paid for an excess leverage cannot be deducted from the tax base if  $\mu_j$  is above a certain fixed  $\overline{\mu_j}$ .

We now assume that country 2 introduces such a rule, denoted by  $\varphi_2$ , where  $\varphi_2 = 1$  if the rule is effectively binding, and 0 otherwise. Whether the rule is binding for an affiliate depends on the difference between the actual inter-company debt share and the maximum accepted, i.e. whether a company is above the threshold level or not, and how the type of internal debt is classified for tax purposes. Note that  $\varphi_2$  is always 0 if  $\mu_2 < \overline{\mu_2}$ . We extend the profit function by the additional tax payments arising from excess leverage above the thin-capitalization rule limit:

$$-i_2(\mu_2 - \overline{\mu_2})t_2^i\varphi_2k_2.$$

The profit function (1) becomes

$$\begin{aligned}\pi = & f(k_1)(1-t_1) + f(k_2)(1-t_2) - r(k_1 + k_2) \\ & + [i_2\mu_2(t_2^i - t_1) - i_2(\mu_2 - \overline{\mu_2})t_2^i\varphi_2 - c_2(\mu_2) + g_2(\mu_2)]k_2.\end{aligned}\quad (2)$$

The optimal share of inter-company debt of subsidiary 2 financed by parent equity is obtained by the following first-order condition

$$i_2(t_2^i - t_1 - t_2^i\varphi_2) + g_{2,\mu}(\mu_2) - c_{2,\mu}(\mu_2) \stackrel{!}{=} 0. \quad (3)$$

First, we consider the case without application of a thin-capitalization rule. Accordingly, the share of inter-company debt is determined by the tax-rate difference between the borrowing affiliate and the parent company,  $(t_2^i - t_1)$ . The internal lending rate can be used to

leverage the tax effect. However, the interest rate is not likely to be an important degree of freedom, as the arm's length principle easily applies.

Secondly, we consider cases where the thin-capitalization rule is applied. If  $\varphi_2$  becomes 1, any tax incentive to use internal debt is effectively stopped. In this case, only the tax-rate level at the location of the lending parent has an impact. Additionally, inter-company debt used for non-tax reasons becomes more expensive, because inter-company interest payments are taxed twice. Assuming a binding case, this is an incentive to reduce  $\mu_2$  in order to avoid enforcement of the thin-capitalization rule.

We can derive comparative static properties by differentiating the first-order condition:

$$-i_2 dt_1 + [i_2 - i_2 \varphi_2] dt_2^i + [t_2^i - t_1 - t_2^i \varphi_2] di_2 = [c_{2,\mu\mu}(\mu_2) - g_{2,\mu\mu}(\mu_2)] d\mu_2.$$

First, let us consider the effect of an increasing tax rate at the lending company's location on the share of inter-company debt used by its affiliate.<sup>5</sup> The derivative equals

$$\frac{d\mu_2}{dt_1} = \frac{-i_2}{c_{2,\mu\mu}(\mu_2) - g_{2,\mu\mu}(\mu_2)} < 0. \quad (4)$$

Expression (4) is always negative, i.e. the inter-company debt used by an affiliate decreases with an increasing tax rate at the parent's location. With regard to the marginal effect of an increasing tax rate at the affiliate's location we obtain

$$\frac{d\mu_2}{dt_2^i} = \frac{i_2 - i_2 \varphi_2}{c_{2,\mu\mu}(\mu_2) - g_{2,\mu\mu}(\mu_2)} \geq 0. \quad (5)$$

This expression is positive when the thin-capitalization rule is not enforced, i.e.  $\varphi_2 = 0$ . Otherwise, if the share of inter-company debt is above the limits, i.e.  $\varphi_2 = 1$ , a tax

<sup>5</sup> We assume a zero marginal tax-rate effect on the internal interest rate  $i_2$ . This is a reasonable assumption, because the arm's length principle is easily applied to interest rates.

rate increase has no effect on the optimal share of inter-company debt. This can be explained by the fact that interest payments for the excessive debt cannot be deducted for tax purposes. Higher internal borrowing must be due to non-tax reasons, e.g. short-term cash management. Accordingly, a tax-rate variation does not matter for the optimal inter-company debt in this case. To sum up, the following proposition can be set up:

**Proposition 1:** *The optimal share of inter-company debt should increase with an increasing tax rate at the subsidiary's location and decrease with an increasing tax rate at the parent's location. Hence, if the share of internal debt is tax driven, the share of inter-company debt should increase with an increasing tax-rate difference,  $(t_2^i - t_1)$ .*

Finally, let us consider a reform of the thin-capitalization rule. Germany significantly reduced the safe haven in 2001 and 2004, respectively. Given any distribution of  $\mu$ , a stricter thin-capitalization rule is associated with more companies above the lower threshold level. Reductions of  $\overline{\mu_2}$  increase the number of cases for which  $\varphi_2$  becomes one, i.e. where the rule is binding and enforced. However, it should be emphasized that identification of each affected company is difficult due to various reasons we already discussed in section 2. Equation (3) implies that tax incentives to use inter-company debt decrease. In this case, the firm reduces its debt share below the new threshold level and prefers equity as the marginal source of finance. Therefore, we would expect that the level of inter-company loans has, on average, decreased since 2001 and 2004, respectively.

**Proposition 2:** *If inter-company debt is a channel for shifting taxable profits, and thin-capitalization rules can limit tax-planning behaviour, a reduction of the allowed debt-to-equity ratio should lead to smaller shares of inter-company debt. Non-incorporated com-*

panies, which are not treated by the German thin-capitalization rule and its amendments, do not reduce their inter-company debt levels.

## 4 Empirical Implications

We test the above propositions empirically by using data for German inbound FDI. A simple estimation approach to test proposition 1 could be a regression of the inter-company leverage, denoted by  $ICL$ , of an investment in country  $G$  (Germany) taken by firm  $k$  located in country  $j$  in period  $t$  on the tax-rate differential ( $STR_{G,t} - STR_{j,t}$ ) and on some company-specific characteristics  $x_{j,t}$ . Thus, a simple regression equation would be

$$ICL_{k,j,t} = a_0 + a_1(STR_{G,t} - STR_{j,t}) + a_2x_{k,j,t} + a_k + a_t + \varepsilon_{k,j,t}^{ICL}, \quad (6)$$

where  $a_k$  is a company-specific effect to control for heterogeneity between company groups. Furthermore, we control for German capital market constraints or aggregate shocks by a time-specific effect  $a_t$ . Note that we are able to identify tax-rate effects because of cross-country and time variation in  $STR_{j,t}$ . Following proposition 1, we expect a positive sign of the tax differential coefficient  $a_1$  on  $ICL$ . For inter-company debt, which is refinanced by equity, the local interest rate at the lending parent country should be irrelevant. Only the German lending rate could be of importance, as it is used as the arm's length benchmark by the German tax authority. However, we implicitly control for the German lending rate by time effects  $a_t$ , since every inbound investor faces the same lending rate.

We cannot explicitly identify companies which are affected by stricter thin-capitalization rules. However, two reforms in 2001 and 2004 constitute exogenous sources of variation, unambiguously affecting the average value of our dependent variable for some groups.

Hence, we test proposition 2 using a difference-in-differences approach (see for example Meyer, 1995).

Different amendments of the German thin-capitalization rule have constituted three groups with different degrees of treatment. We use a dummy variable,  $D_{TGROUP}$ , to denote the respective treatment group, i.e. the corporations which were treated by a specific amendment of the thin-capitalization rule in 2001 or 2004, respectively. Additionally, we use a dummy variable  $D_{post}$  to indicate the post-amendment observations from 2001 to 2004. In this manner, an estimation equation for the 2001 reform effect can be described as

$$ICL_{k,j,t} = b_0 + b_1(STR_{G,t} - STR_{j,t}) + b_2x_{k,j,t} + b_3D_{TGROUP} + b_4D_{TGROUP}D_{post} + b_k + b_t + \varepsilon_{k,j,t}^{ICL}. \quad (7)$$

The treatment group consists of both ordinary corporations and holding corporations. It is important to bear in mind that partnerships were not treated by the German thin-capitalization rule and constitute a suitable non-treatment group of the reform in 2001. Group-independent time trends are absorbed by  $b_t$ . Therefore, we implicitly control for yearly variations in German tax rates. The treatment effect is measured by  $b_4$ , where we expect a negative sign.

Furthermore, for the 2004 reform effect, we propose the following equation

$$ICL_{k,j,t} = c_0 + c_1(STR_{G,t} - STR_{j,t}) + c_2x_{k,j,t} + c_3D_{TGROUP} + c_4D_{TGROUP}D_{2004} + c_k + c_t + \varepsilon_{k,j,t}^{ICL}, \quad (8)$$

where only holdings were treated by the reform of the German thin-capitalization rule in 2004. Therefore, all other companies, incorporated and non-incorporated, constitute the non-treatment group. We would also expect a negative sign of the treatment effect  $c_4$ .

To sum up, the legal reforms enable us to test whether a thin-capitalization rule is effectively imposed. The tax reform of 2001 only hit ordinary incorporated as well as holding companies. Partnerships, however, were not affected. In 2004, only holding corporations were affected. We argue that groups are comparable, because we observe only affiliates of multinationals. Hence, we look at firms which have the same opportunities with respect to, for example, internal finance. Furthermore, we control for differences across single investments, for example by using the affiliate-specific turnover as a control variable. We additionally assume that there are no systematic changes in within- and between-group compositions. In fact, our group sizes are almost stable over time. To identify the effect on the treated companies, a further critical assumption is that both groups are equally affected by aggregate shocks.

## 5 Data and Descriptive Statistics

The empirical analysis uses the *MiDi* database for multinationals provided by the *Deutsche Bundesbank*. This is a comprehensive annual micro database of direct investment positions of German enterprises held abroad as well as of direct investment positions held in Germany by foreign companies. However, we employ only German inbound FDI data. The data provides information about the investment object's balance sheet, including further information on the type of investment and on the investor. A favourable characteristic of the data is the possibility to trace direct investment positions of individual firms over time. The current version provides firm-level panel data for the period 1996 to 2004. The collec-

tion of the data is enforced by German law, which sets reporting obligations for certain international transactions and positions.<sup>6</sup>

-- Insert Table 1 about here --

The database comprises direct FDI and indirect FDI positions, for holdings above a certain threshold level. Given that the model deals with a simple two-tier company structure, indirectly held investments are excluded. Moreover, we only keep observations exhibiting a non-zero inter-company debt share. Table 1 displays the number of observations in our sample, the means of the share of non-German internal debt, the means of the country-specific tax-rate differentials, and the yearly average number of investment objects. Investors are mainly from Germany's neighbouring countries, e.g. Switzerland, Austria, France, or the Netherlands. Of course, investors from other big economies such as Japan or the USA are also strongly represented.

According to equation (6), we calculate the inter-company loan, borrowed from the foreign parent company, to total capital ratios, ICL, using the Midi data. In order to control for company-specific variation in the accession to external debt, we employ the turnover as an indicator of the size and the affiliate's cash-flow in our regression analysis (see e.g. Panno, 2003). We expect a negative effect of a higher turnover when external and internal debt serve as substitutes (see Buettner et al., 2006a). As agency costs and the utility of inter-company debt may also vary across industries, we control for further heterogeneity by including dummies for 56 industries at the level of the affiliate.

---

<sup>6</sup> Sec. 26 Aussenwirtschaftsgesetz (Law on Foreign Trade and Payments) in connection with Aussenwirtschaftsverordnung (Foreign Trade and Payment Regulations). Since 2002, FDI has to be reported if the participation is 10% or more and the balance sheet total of the foreign investment in Germany is above 3 million Euro. For details see Lipponer (2006). Despite that previous years showed lower threshold levels, we apply this threshold level uniformly for all years in the panel.



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The statutory tax-rate differential constitutes the relevant measure to investigate the tax impact on the use of inter-company debt. The variable  $STR_G$  contains German statutory profit tax rates;<sup>7</sup> foreign statutory tax rates are denoted by  $STR_F$ . While using these two tax measures, bilateral tax-rate differences are constructed. Since the effective tax reduction from using debt might be zero if a subsidiary carries forward any losses for tax purposes (see MacKie-Mason, 1990; Francois, 2006), we include a dummy variable indicating whether some loss carry-forward is reported. Of course, the existence of some losses in the previous periods may capture other characteristics of the current decision problem of the company such as the expected performance of an affiliate. Thus, the overall effect on internal leverage is ambiguous. Table 2 displays basic information about the regression variables.

-- Insert Table 2 about here --

## 6 Empirical Results

The empirical analysis involves panel-data regressions that include company fixed effects. Hence, by using a within transformation, we generally control for all time-constant heterogeneity between company groups.

-- Insert Table 3 about here --

First of all, it is worth mentioning that all regressions show the expected tax rate effect. In Table 3, specification (2) indicates, for example, that a 10 percentage point increase in the

<sup>7</sup> Our measure takes into account that only half of all interest payments can be deducted from the tax base of the German trade income tax. Furthermore, we consider the country average of the local trade income tax.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

tax-rate differential between Germany and any other country is associated with a 1.9 percentage point higher internal-debt ratio. The magnitude of the tax effect is in line with earlier findings, see *e.g.* Desai et al. (2004), or Buettner et al. (2006a). This result indicates that tax-rate differentials play an important role in the choice of financial structures. With regard to the effect of the German thin-capitalization reform in 2001, we control for systematic differences in the control and treatment group by introducing a treatment-group dummy variable,  $D_{TGROUP}$ . First, we do not distinguish between different treatment groups in specifications (3)-(5) of Table 3. While we interact the treatment group with a post-reform dummy,  $D_{POST}$ , for the whole period of 2001 until 2004 in column (3), we control for each single year in columns (4) and (5). In column (4) we observe that the treated group, i.e. holdings and incorporated firms, responds to the tighter thin-capitalization rule, and internal lending is reduced in the post-reform period. Column (5) shows that the reform was by no means anticipated. Rather, it took the companies one year to reduce their internal debt shares. This is possibly the result of a restructuring process which started in 2001.

A company is only affected if the thin-capitalization rule is binding, i.e. if the firm's debt-to-equity share is above the maximally accepted share. In this case, the tax-planning firm should re-optimize its capital structure after the reform, if the construction so far has been optimal. Nevertheless, given the continuum of internal-debt-to-equity shares, not all corporations are affected. However, the mean share is reduced for the whole treatment group because of certain corporations. Consequently, the treatment effect would be much stronger if all treated corporations were noticeably affected.

-- Insert Table 4 about here --

In Table 4 we split the sample into different treatment groups. As already mentioned, we have two treatment groups for the 2001 reform, i.e. holdings and ordinary incorporated companies. The results are generally comparable, apart from the fact that the number of observations is reduced.<sup>8</sup> The specifications (1)-(3) consider ordinary corporations as the treatment group and partnerships as the control group. Specifications (4)-(6) investigate the tax effects on inter-company debt of holding corporations; partnerships constitute the control group again. One major insight from Table 4 is that holdings adapt their capital structure much faster than ordinary incorporated companies. The restructuring process is possibly easier, and therefore faster for some reason. Moreover, the threshold level was reduced more severely for holding corporations. Another reason might be the potential role of holding corporations as special tax-planning entities.

The magnitude of the treatment effects can be interpreted as follows. For holding corporations, the 2001 thin-capitalization reform induced a decline in the share of internal debt borrowed from the foreign parent company of about 10 percentage points. This equals a reduction of approximately one-third, considering a pre-reform mean of 31.7 per cent inter-company debt to total capital.

Finally, we focus on the effect of the German thin-capitalization reform in 2004. This reform treated holding corporations only. The control group consists of all other legal forms. The results in Table 5 show once more that some companies restructure, basically those which were affected by the stricter rule, and reduce their internal debt share, i.e. the mean debt share decreases for the treated group. Specifications (1) and (2) are based on observations from 1996-2004. However, regressions in columns (3) and (4) are only based on observations from 2001 to 2004, in order to avoid the effect of the first thin-capitalization

<sup>8</sup> Note, however, that the group sizes are relatively constant for the 9 years in the sample.

reform in 2001. The magnitude of the 2004 reform effect is much lower compared to the 2001 reform. Here, the share of inter-company debt is reduced by approximately 4.2 percentage points. This equals a reduction of about one sixth, given the pre-reform level of 26 per cent inter-company debt to total capital.

-- Insert Table 5 about here --

## 7 Conclusion

We find that international tax-rate differentials play an important role in determining the share of internal lending to German affiliates. This confirms earlier results provided by other studies. The important insight of our empirical analysis is that German thin-capitalization rules are effectively imposed. A reduction of the allowed debt-to-equity ratios, enforced by reforms in 2001 and 2004, respectively, induced significantly smaller shares of inter-company loans of incorporated companies.

Finally, we focus on revenue effects. Although we cannot estimate how much revenue Germany would lose in the absence of a thin-capitalization rule, rough estimations of the reform effects can be provided. First of all, we consider specifications (3) and (6) from Table 4. In 2002, the 2001 reform is associated with lower internal-debt-to-capital ratios of approximately 0.053 for ordinary corporations and 0.151 for holding corporations, respectively. Given the respective mean values, Germany was able to retain, on average, 71,700 Euros per ordinary corporation and 1,807,000 Euros per holding corporation in additional tax revenue through the tightening of the thin-capitalization rule.<sup>9</sup> Considering the number of treated corporations, we estimate an amount of approximately 260 million Euros in ad-

<sup>9</sup> We assume as *price* for the internal credit a German lending rate for credits to the private sector of 9.7% in 2002 (IMF, 2005), and the 2002 statutory tax rate, 32.88%.

ditional tax revenue. Secondly, using specification (4) of Table 5, we estimate the additional tax revenue to be up to approximately 30 million Euros for the reform in 2004. Total amounts might be higher due to the treatment of indirectly held foreign affiliates or of other debt types. Moreover, the internal lending rate is not necessarily equivalent to the local lending rate. All estimated magnitudes can only be rough estimates, because we cannot take into account that multinationals—in case of restrictions on their capital structure choice—are able to shift profits through other channels, e.g. by transfer-price setting.

The German government is obviously aware that multinationals exploit tax-planning opportunities. Generally, our results suggest that governments are able to restrict these tax-planning activities. However, restricting corporations in shifting profits can cause adverse investment effects of profit-shifting restrictions. This trade-off presents new challenges and opportunities for future research.

## Data Sources and Definitions

**Firm-level data** are taken from the micro-level dataset of the Bundesbank, see Lipponer (2006) for an overview. The inter-company debt share from the foreign parent company is determined by the level of balance-sheet liabilities in the respective category divided by total capital consisting of registered capital, capital reserves and profit reserves, as well as internal and external debt.

**Corporate taxation** data are taken from the IBFD, and from tax surveys provided by the tax advisory companies Ernst&Young, PwC and KPMG.

## Acknowledgments

We are grateful to the Deutsche Bundesbank for granting access to the FDI database. Financial support by the German Research Foundation (DFG) is gratefully acknowledged. We are also indebted to Thiess Büttner, Ulrich Schreiber, and an anonymous referee for insightful comments. Errors remain the responsibility of the authors.

## References

- Buettner, T., M. Overesch, U. Schreiber, and G. Wamser (2006a), *Taxation and the choice of capital structure - Evidence from a panel of German multinationals*, CESifo Working Paper 1841, Munich.
- Buettner, T., M. Overesch, U. Schreiber, and G. Wamser (2006b), *The impact of thin capitalization rules on multinationals' financing and investment decisions*, CESifo Working Paper 1817, Munich.
- Desai, M.A., C.F. Foley, and J.R. Hines (2004), A multinational perspective on capital structure choice and internal capital markets, *The Journal of Finance* 59, 2451-2487.
- European Communities (2005), Structures of the taxation systems in the European Union, Data 1995-2003, Luxembourg.
- Francois, P. (2006), Tax loss carry-forwards and optimal leverage, *Applied Financial Economics* 16, 1075-1083.
- Fuest, C. and T. Hemmelgarn (2005), Corporate tax policy, foreign firm ownership and thin capitalization, *Regional Science and Urban Economics* 35, 508-526.
- IMF (2005), International financial statistics yearbook, Washington D.C.
- Jensen, M. and W.H. Meckling (1976), Theory of the firm: managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 42, 159-185.
- Jensen, M. (1986), Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* 76, 323-329.
- Lipponer, A. (2006), *Microdatabase Direct Investment -MiDi. A brief guide*, Bundesbank Working Paper, Frankfurt.
- MacKie-Mason, J. (1990), Do taxes affect corporate financing decisions? *The Journal of Finance* 45, 1471-1493.
- Meyer, B.D. (1995), Natural and quasi-experiments in economics, *Journal of Business and Economic Statistics*, 13, 151 - 161.
- Mintz, J. and A.J. Weichenrieder (2005), *Taxation and the financial structure of German outbound FDI*, CESifo Working Paper 1612, Munich.

Modigliani, F. and M. Miller (1958), The cost of capital, corporation finance, and the theory of investment, *American Economic Review* 48, 261-297.

Modigliani, F. and M. Miller (1963), Corporate income taxes and the cost of capital: a correction, *American Economic Review* 53, 443-453.

Myers, S. (1977), Determinants of corporate borrowing, *Journal of Financial Economics*, 5, 147-175.

Panno, A. (2003), An empirical investigation on the determinants of capital structure: the UK and Italian experience, *Applied Financial Economics* 13, 97-112.

Panteghini, P.M. (2006), *The capital structure of multinational companies under tax competition*, CESifo Working Paper 1721, Munich.

Table 1: German Inbound FDI 1996 – 2004

Home Country	Number of Observations	Share of Internal Debt from Foreign Parent Company	Tax Rate Difference	Average Number of Investments
Australia	33	.358	.021	4
Austria	1,245	.240	.019	139
Belgium	564	.284	-.033	64
Canada	162	.280	-.063	19
Cyprus	21	.215	.130	3
Czech Rep.	40	.340	.019	5
Denmark	745	.284	.040	83
Finland	189	.345	.077	22
France	1,988	.249	-.014	223
Great Britain	1,276	.270	.051	144
Greece <sup>a)</sup>	.	.	.	.
Hungary	39	.367	.158	5
Iceland <sup>a)</sup>	12	.283	.074	.
Ireland	63	.488	.251	8
Italy	905	.281	-.069	101
Japan	2,257	.339	-.100	252
Korea (Rep.)	165	.393	.056	21
Lithuania <sup>a)</sup>	.	.	.	.
Luxembourg	388	.235	.001	44
Mexico <sup>a)</sup>	12	.138	.014	.
Netherlands	2,429	.281	.010	273
Norway	177	.279	.078	21
Poland	30	.212	.042	3
Portugal	25	.281	.038	3
Slovakia <sup>a)</sup>	.	.	.	.
Slovenia	75	.221	.109	9
Spain	300	.211	-.043	35
Sweden	565	.249	.076	64
Switzerland	2,725	.276	.112	306
Turkey	51	.316	-.013	6
USA	2,880	.280	-.051	330
Total	19,379	.280	.003	2,195

The table shows a per-country apportionment of parent companies for German inward FDI from 1996 until 2004. Data are taken from the MiDi database provided by the Deutsche Bundesbank. Internal debt shares are country-specific mean values, determined by the level of balance sheet liabilities divided by total capital. The table also shows average statutory tax-rate differences between Germany and respective foreign locations, as well as the yearly average number of investments.

<sup>a)</sup> Not reported due to data protection, because the number of observations is small.

Table 2: Descriptive Statistics

Variable	Definition	Mean	Std.Dev.	Min.	Max.
<i>ICL</i>	internal debt share from foreign parent company	.280	.262	.001	.992
$STR_G - STR_F$	tax-rate difference	.003	.072	-.152	.281
$STR_F$	foreign tax rate	.354	.071	.100	.532
Loss carry-forward	binary	.431	.495	0	1
Turnover	turnover in €1,000	65,088	247,678	1,000	11,000,000

Observations: 19,379. Minimum and maximum values are averages of the 3 smallest (highest) values.



Table 3: Inter Company Loans – Thin-Capitalization Reform in 2001

	(1)	(2)	(3)	(4)	(5)
$STR_G - STR_F$	.188 *	.192 *	.206 *	.207 **	.214 **
	(.088)	(.088)	(.087)	(.087)	(.088)
$D_{TGROUP}$			.001	.002	.018
			(.019)	(.019)	(.020)
$D_{TGROUP} \times D_{POST}$			-.025 *		
			(.010)		
$D_{TGROUP} \times 1997$					-.006
					(.018)
$D_{TGROUP} \times 1998$					-.016
					(.019)
$D_{TGROUP} \times 1999$					-.025
					(.017)
$D_{TGROUP} \times 2000$					-.024
					(.018)
$D_{TGROUP} \times 2001$				-.004	-.021
				(.012)	(.020)
$D_{TGROUP} \times 2002$				-.036 *	-.052 *
				(.015)	(.023)
$D_{TGROUP} \times 2003$				-.032 *	-.049 *
				(.011)	(.020)
$D_{TGROUP} \times 2004$				-.038 *	-.054 *
				(.016)	(.023)
1997	-.003	-.003	-.003	-.003	.003
	(.005)	(.005)	(.005)	(.005)	(.017)
1998	-.002	-.002	-.002	-.002	.013
	(.006)	(.006)	(.006)	(.006)	(.017)
1999	-.001	-.001	-.002	-.002	.022
	(.005)	(.005)	(.005)	(.005)	(.016)
2000	-.000	-.000	-.000	-.000	.022
	(.006)	(.006)	(.006)	(.006)	(.017)
2001	.002	.002	.025 **	.006	.022
	(.005)	(.005)	(.011)	(.012)	(.019)
2002	-.011	-.010	.013	.023	.038
	(.006)	(.007)	(.011)	(.015)	(.021)
2003	-.024 **	-.024 **	-.001	.006	.020
	(.006)	(.006)	(.010)	(.011)	(.018)
2004	-.022 **	-.022 **	.001	.013	.028
	(.007)	(.007)	(.007)	(.016)	(.021)
ln(Turnover)	-.016 **	-.015 **	-.015 **	-.015 **	-.015 **
	(.004)	(.004)	(.004)	(.004)	(.004)
Loss carry-forward		.009	.009	.009	.009
		(.005)	(.005)	(.005)	(.005)
Observations	19,379	19,379	19,379	19,379	19,379
Adj. $R^2$	.711	.711	.711	.711	.711

The dependent variable is the share of inter-company loans borrowed from the foreign parent company. Robust and clustered (country/year clusters) standard errors are in parentheses. A star denotes significance at 5% and two stars at the 1% level. All estimates include a full set of 5,257 firm and 56 industry fixed effects.

Table 4: Inter Company Loans – Thin-Capitalization Reform in 2001

	(1)	(2)	(3)	(4)	(5)	(6)
$STR_G - STR_F$	.201 *	.216 *	.224 *	.783 **	.750 **	.737 **
	(.089)	(.088)	(.090)	(.287)	(.288)	(.294)
$D_{TGROUP}$		.003	.019		.019	.100
		(.019)	(.020)		(.074)	(.084)
$D_{TGROUP} \times D_{POST}$		-.025 *			-.101 **	
		(.010)			(.018)	
$D_{TGROUP} \times 1997$			-.006			-.044
			(.018)			(.028)
$D_{TGROUP} \times 1998$			-.017			-.017
			(.019)			(.035)
$D_{TGROUP} \times 1999$			-.026			-.036
			(.017)			(.032)
$D_{TGROUP} \times 2000$			-.024			-.085 *
			(.018)			(.034)
$D_{TGROUP} \times 2001$			-.020			-.125 *
			(.020)			(.038)
$D_{TGROUP} \times 2002$			-.053 *			-.151 *
			(.023)			(.041)
$D_{TGROUP} \times 2003$			-.050 *			-.193 *
			(.020)			(.042)
$D_{TGROUP} \times 2004$			-.052 *			-.221 *
			(.023)			(.046)
1997	-.002	-.002	.003	-.006	-.006	.003
	(.006)	(.006)	(.017)	(.014)	(.015)	(.019)
1998	-.002	-.002	.013	.007	.006	.009
	(.006)	(.006)	(.017)	(.013)	(.014)	(.018)
1999	-.002	-.002	.022	.019	.015	.020
	(.005)	(.005)	(.016)	(.013)	(.014)	(.018)
2000	-.000	-.000	.022	.008	.000	.016
	(.006)	(.006)	(.017)	(.015)	(.015)	(.019)
2001	.003	.026 *	.022	.026	.040	.040
	(.006)	(.011)	(.019)	(.020)	(.020)	(.023)
2002	-.010	.013	.039	.034	.046 *	.051 *
	(.007)	(.011)	(.021)	(.020)	(.021)	(.024)
2003	-.024 **	-.002	.021	.006	.018	.031
	(.006)	(.011)	(.018)	(.017)	(.018)	(.021)
2004	-.019 **	.003	.028	.018	.029 **	.048
	(.007)	(.012)	(.021)	(.020)	(.020)	(.025)
ln(Turnover)	-.014 **	-.014 **	-.014 **	-.019 **	-.017 *	-.018 *
	(.004)	(.004)	(.004)	(.007)	(.007)	(.007)
Loss carry-forward	.009	.009	.009	-.011	-.013	-.014
	(.006)	(.005)	(.005)	(.015)	(.014)	(.014)
Observations	18,787	18,787	18,787	2,196	2,196	2,196
Adj. $R^2$	.714	.714	.714	.806	.810	.811

The dependent variable is the share of inter-company loans borrowed from the foreign parent company. Specifications (1) - (3) are based on a sample of ordinary corporations and partnerships. Specifications (4) - (6) are based on a sample, which consists of holding corporations and partnerships. Robust and clustered (country/year clusters) standard errors are in parentheses. A star denotes significance at 5% and two stars at the 1% level. All estimates include a full set of 5,105/738 firm and 56 industry fixed effects.

Table 5: Inter Company Loans – Thin-Capitalization Reform in 2004

	(1)	(2)	(3)	(4)
$STR_G - STR_F$	.192 *	.193 *	.406 *	.410 *
	(.088)	(.088)	(.201)	(.200)
$D_{TGROUP}$		.050 *		.026
		(.020)		(.024)
$D_{TGROUP} \times D_{2004}$		-.068 *		-.042 *
		(.021)		(.019)
1997	-.003	-.003		
	(.005)	(.005)		
1998	-.002	-.002		
	(.006)	(.006)		
1999	-.001	-.001		
	(.005)	(.005)		
2000	-.000	-.000		
	(.006)	(.006)		
2001	.002	.002		
	(.005)	(.006)		
2002	-.010	-.011	-.014 **	-.014 **
	(.007)	(.007)	(.004)	(.004)
2003	-.024 **	-.024 **	-.034 **	-.035 **
	(.006)	(.006)	(.005)	(.005)
2004	-.022 **	-.020 **	-.029 **	-.028 **
	(.007)	(.007)	(.005)	(.005)
ln(Turnover)	-.015 **	-.015 **	-.009	-.009
	(.004)	(.004)	(.007)	(.007)
Loss carry-forward	.009	.009	.026 *	.026 *
	(.005)	(.005)	(.010)	(.010)
Observations	19,379	19,379	7,980	7,980
Adj. $R^2$	.711	.712	.773	.773

The dependent variable is the share of inter-company loans borrowed from the foreign parent company. Specifications (1) - (2) are based on the whole sample, whereas (3) and (4) are based on a sample in which only observations from 2001 until 2004 are considered. Robust and clustered (country/year clusters) standard errors are in parentheses. A star denotes significance at 5% and two stars at the 1% level. All estimates include a full set of 5,257 or 3,196 firm, and 56 industry fixed effects.